
Photostabilization of a Nitromethylene Heterocycle Insecticide on the Surface of Montmorillonite

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Abstract: The photochemical stability of the insecticidal compound tetrahydro-2-(nitromethylene)-2H-1,3-thiazine (NMH) adsorbed on montmorillonite (Mont), in the presence or in the absence of a second organic chromophore was studied. Two different organic dyes were investigated as possible stabilizers of NMH: the divalent cation methyl green (MG) and the monovalent cation thioflavin T (TFT). Samples of free NMH and of the adsorption complexes Mont-NMH, Mont-MG-NMH, and Mont-TFT-NMH were exposed to direct sunlight, and the residual insecticidal activity was estimated. Some photostabilization of the pesticide adsorbed to the clay was observed. The highest degree of photoprotection was achieved in samples containing 0.5 mmole of TFT and 0.2 mmole of NMH/g clay. Increasing the load of TFT to 0.8 mmole/g clay resulted in a complete loss of photostabilization. The interactions of the organic molecules at the clay surface were studied by UV-VIS absorption and Fourier-transform infrared spectroscopy. For the Mont-NMH and Mont-MG-NMH complexes, the observed photostabilization is probably due to clay-NMH interactions. In the Mont-TFT-NMH complex specific interactions between the cationic dye and the pesticide molecules probably occurred as well.

Key Words: Adsorption • Clay-organic complex • Infrared spectroscopy • Montmorillonite • Nitromethylene heterocycle • Pesticide • Photostabilization

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